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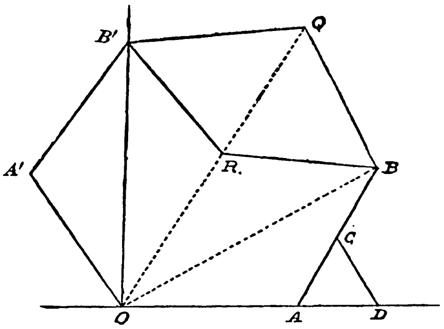
NOTES.

I.

Link-Work for x^2.

(*Extract from a Letter of* Professor Cayley *to* Mr. Sylvester.)

I suppose the following is substantially your link-work for x^2. I use a slot to make D move in the line OA; but this could be replaced by proper link-work. Supposing O and A fixed; the line OB is movable, and I wanted to have the distance OB measured in a fixed direction. This can be done by a hexagon $OABQB'A'$ with equal sides, and two other equal links $B'R$, BR: then of course, if O, R, Q are in lineâ, the hexagon will be symmetrical as to OQ, and OB' will be equal OB, and B' may be made to move in the fixed line OB'.



$$BOA = \tfrac{1}{2}\theta, \quad OA = AB = a, \quad AC = CD = \tfrac{1}{2}a,$$

then $$OB = 2a\cos\tfrac{1}{2}\theta, \quad OD = a(1+\cos\theta) = 2a\cos^2\tfrac{1}{2}\theta,$$

or $$2a\,.\,OD = (OB)^2.$$

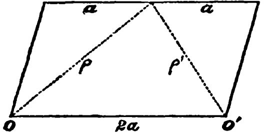
30th November, 1877.

II.

Link-Work for the Lemniscate.

(*Extract from a Letter of* Mr. A. W. Phillips *of New Haven.*)

In regard to the description of the Lemniscate I found in working upon the 3-bar link-work, if O and O' were fixed points, $ABO'O$ a parallelogram, $AP = PB$ and $OA = r = \sqrt{2}a$, that P would describe the lemniscate of which O and O' were the foci. The complete equation of the curve described by P expressed in bipolar coordinates reduces to



$$(\rho^2 + \rho'^2 - 6a^2)(\rho^2\rho'^2 - a^4) = 0,$$

where $\rho^2 + \rho'^2 - 6a^2 = 0$ is the equation of a circle in bipolars. Then $\rho^2\rho'^2 - a^4 = 0$ gives $\rho\rho' = a^2$ the equation to the lemniscate.

8th May, 1878.